# REPORT

OF THE

# PRESIDENT AND MANAGERS

OF THE

# SCHUYLKILL NAVIGATION COMPANY,

TO THE

# STOCKHOLDERS.

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January 6, 1845.

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PHILADELPHIA:
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1845.

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# REPORT.

*To the Stockholders of the Schuylkill Navigation Company.—January 6th,* 1845.

The President and Managers respectfully report:

That the requisite Winter repairs having been made, the navigation was opened throughout the line on the 18th of March, 1844, and continued open until closed by ice in December.

The policy of maintaining the works in good order as economically as possible, has been continued during the past year, and further progress has been made in the important matter of deepening the channels.

The natural flow of the Schuylkill river has furnished an abundant supply for the navigation throughout the line, except during the existence of a drought of almost unexampled duration and intensity, which began in July, and continued for two months, and was experienced over a great extent of country, and which exhibited in a striking light the value of the Company's reservoirs. The two reservoirs on Tumbling run, containing more than sixty-five millions of cubic feet of water, ready for use when needed, were resorted to, and kept up the

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navigation on the upper part of the line ; and, when the drought ended, a considerable quantity of water was still in reserve.

The principal difficulty experienced in the dry season was in the Norristown pool, on the lower portion of the navigation, where the river is large, and where the supply of water would have been ample, had it not been drawn in very great quantities from the pool by certain mill-owners at Norristown, in open violation of law, and for the recovery of damages on account of which legal proceedings have been commenced.

After a careful and deliberate investigation of the subject of Tolls, the Board fixed the rate on coal for the commencement of the season at one-third of a cent per ton per mile, or thirty-six cents per ton from Port Carbon to Philadelphia ; being a rate one-third less than that charged in the two preceding years ; and the rate thus fixed has been continued to the close of the year. The tolls on other articles have been the same as in 1843.

In respect to the competition at present existing in the transportation of coal from Schuylkill county, the views of the Board as expressed in their last annual report remain unaltered. They have no doubt that to carry the coal afloat is to carry it in the cheapest possible way ; and they look with the deepest interest to the continued improvement of the Schuylkill Navigation, so as to connect it more and more closely with those great channels of water communication by which the bulk of the coal is conveyed to the great centres of consumption.

Although the existing competition has had the injurious influence of diminishing your receipts for the year, it has served the important purpose of expanding *vastly* the mining operations of the inexhaustible coal region, which is and will be tributary to your work. And although there has been a diminution in the amount of coal brought down by your line of nearly eleven per cent., and a reduction of the rate of toll on that article of one third, the receipts of the company for the year, have exceeded the current expenses and the interest on the loans by more than $20,000.

The progressive increase of population, trade and manufactures, in the valley of the Schuylkill, is indicated by the increase of the miscellaneous tonnage carried upon your navigation. The ascending tonnage has increased from 36,718 tons in 1843, to 41,281 tons in 1844, being an addition of more than twelve per cent.; and the miscellaneous descending tonnage has increased from 109,580, to 133,303 tons, or twenty-one per cent. additional, and making an aggregate trade upon your works in the year of 573,471 tons; and it is a gratifying fact that the increase of the trade in iron, principally descending, has exceeded sixty per cent.

The direct coal trade from the Schuylkill region carried through to New York, by the way of the Delaware and Raritan Canal, amounts this season to 111,521 tons.

Under the authority given by the stockholders at their last annual meeting the Managers opened a subscription to a convertible loan of $297,073 07, payable on the first of December, 1860, for the purpose of paying off two loans, amounting in the aggregate to the same sum, and falling due December, 1st, 1844, and January 1st, 1845. The amount now subscribed to this loan is $253,153 33, and the required balance having been provided by temporary loans, the certificates of the loans falling due have been promptly paid on presentation.

With a view to the further improvement of the navigation, the Board applied to the Legislature at its last session and obtained an extension of the time for improving and completing the works, for fifteen years from March 8th, 1845, and at the same time the restriction which prevented persons not citizens from holding stock was removed.

The surveying of the line, and the sounding of the depth of the water spoken of in the last annual report as being then in progress, have since been completed; and at the request of the Board of Managers, the President has prepared a report on the Improvement of the Navigation, which is herewith submitted, together with a copy of a resolution in relation to it unanimously adopted by the Board.

Since the last report, mile posts have been set up along the towing-paths so as to indicate accurately the distances from point to point.

At various intervals, the labourers hired for the purpose of making repairs have been employed in raising the canal banks and towing-paths, which, although it is in fact new work, is included in the item of current expenses.

The amount of rents received in 1844, is $20,813 six cents, being larger than in any former year.

The general statement marked A, and the statement of the accounts of the Schuylkill Navigation Company, marked B, presented with this report, exhibit the present condition of the Company's affairs. And the statements marked C. and D. show the descending and ascending tonnage of the year. Another statement marked E, is also appended to exhibit the quantity of Anthracite coal carried upon different lines of communication in 1844.

All which is respectfully submitted.
By order of the Board of Managers,
Solomon W. Roberts,
President.

Office of the Schuylkill Nav. Co.
Jan. 6th, 1845.

"Resolved.—That the Report made by the "President upon the Improvement of the Naviga-"tion, be laid before the Stockholders at their "meeting on Monday next, and that they be "respectfully informed that the Board unanimously "approve of the plan proposed, and, if encouraged, "and sustained by the Stockholders, it will, in their "opinion, be the duty of the Board to proceed to "carry the same into execution as rapidly as may "be in their power."

Extract from the Minutes,
By order of the Board of Managers,
Claudius Harper,
Secretary.

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## LIST OF OFFICERS FOR 1845.

Solomon W. Roberts, *President.*

### MANAGERS.

Thomas Firth,
John Sergeant,
Mordecai D. Lewis,
William Ashbridge,
Jacob G. Morris,
John C. Cresson.

William H. Dillingham,
Richard D. Wood,
William E. Hacker,
John W. Claghorn,
Henry C. Corbit,
Samuel Bispham.

Claudius Harper, *Treasurer and Secretary.*

## A.

## GENERAL STATEMENT

OF THE

*Schuylkill Navigation Company, January* 1st, 1845.

| | | | |
|---|---|---|---|
| General charges, cost of works | $3,549,040 59 | Capital Stock | $1,665,600 00 |
| Amount paid for damages | 153,116 26 | Permanent Loans | 1,790,520 19 |
| Amount paid for real estate including $16,661 08 sold, not paid for | 194,387 84 | Bonds payable | 10,327 50 |
| | | Profits disbursed in payment of loans, damages, and new work | 430,097 00 |
| | $3,896,544 69 | | $3,896,544 69 |

## B.

### *Statement of the Accounts of the Schuylkill Navigation Company for* 1844.

| | | | | |
|---|---|---|---|---|
| Balance of Income and expense account, January 1, 1844 | $43,993 84 | Current expenses for repairs | | $45,325 84 |
| Received from Reading R. R. Co. on account of damages done to property of Sch. Nav. Co. during construction of Rail Road | 8,235 05 | Current expenses for salaries and wages | | 28,743 69 |
| Received from Mount Carbon and Port Carbon R. R. Co. on account of damages | 1,500 00 | Interest account | | 96,502 61 |
| Amount of Tolls received in 1844 | 169,880 25 | John M. Crosland's debt cancelled by authority of Stockholders | | 500 00 |
| " Rents " " | 20,813 06 | Individual accounts unsettled | | 9,024 21 |
| Unclaimed dividends | 879 22 | Schuylkill Navigation Stock | | 500 00 |
| " interest | 4,364 21 | Loans of Sch. Nav. Co. held by the President in trust | | 45,984 18 |
| Individual accounts unsettled | 250 78 | Bills receivable | | 7,711 37 |
| Bills payable | 67,000 00 | Cash | | 78,773 25 |
| | | Amount of profits disbursed in payment of loans | $500 00 | |
| | | Damages | 4,618 78 | |
| | | New work, deepening channels, &c. | 2,774 62 | |
| | | | $7,893 40 | |
| | | Less received for Real Estate sold | 4,042 14 | 3,851 26 |
| | $316,916 41 | | | $316,916 41 |

## C.

### *Tonnage of Articles descending the river in* 1844.

| | | |
|---|---|---|
| Coal | Tons | 398,887 |
| Lime | " | 41,424 |
| Limestone | " | 34,377 |
| Lumber | " | 12,652 |
| Grain | " | 7,540 |
| Flour | " | 7,315 |
| Iron | " | 6,555 |
| Wood | " | 4,418 |
| Nails | " | 2,932 |
| Stone | " | 2,851 |
| Iron Ore | " | 2,355 |
| Sand | " | 2,133 |
| Shingles | " | 1,968 |
| Bituminous coal | " | 979 |
| Blooms and Castings | " | 916 |
| Marble | " | 701 |
| Hoop-poles | " | 572 |
| Whiskey | " | 468 |
| Bark | " | 424 |
| Butter and Eggs | " | 259 |
| Rails | " | 195 |
| Bricks | " | 177 |
| Leather | " | 157 |
| Manure | " | 150 |
| Seed | " | 125 |
| Sundries | " | 1,660 |
| | Tons | 532,190 |
| Coal delivered along the line of the navigation | " | 70,638 |

## D.

## *Tonnage of Articles ascending the river, in* 1844.

| | | |
|---|---|---|
| Lumber | Tons | 7,040 |
| Plaster | " | 5,929 |
| Grain | " | 5,872 |
| Merchandize | " | 3,798 |
| Limestone | " | 3,660 |
| Iron | " | 2,710 |
| Salt | " | 2,447 |
| Rails | " | 914 |
| Wood | " | 892 |
| Lime | " | 795 |
| Hay and Straw | " | 760 |
| Sand | " | 717 |
| Bricks | " | 708 |
| Flour | " | 643 |
| Manure | " | 616 |
| Fish | " | 597 |
| Coal | " | 569 |
| Marble | " | 458 |
| Potatoes | " | 353 |
| Staves | " | 337 |
| Stone | " | 288 |
| Iron Ore | " | 247 |
| Shingles | " | 130 |
| Sundries | " | 801 |
| | Tons | 41,281 |

## E.

## *Statement of the quantity of Anthracite Coal carried upon different lines of communication in* 1844.

| | | |
|---|---|---|
| Schuylkill Navigation | Tons | 398,887 |
| Reading Railroad, during the season of navigation | " | 357,230 |
| Ditto during the suspension of navigation | " | 84,500 |
| Schuylkill coal trade | | 840,617 |
| Which is an increase of 164,544 tons over 1843. | | |
| Lehigh canal | " | 379,864 |
| Delaware and Hudson canal | " | 251,005 |
| | Tons | 1,471,486 |

In addition to which, about 75,000 tons have been shipped from the Susquehanna region, and 33,000 tons from the Pinegrove region, making the aggregate shipments of Anthracite coal in 1844 considerably more than a million and a half of tons.

# REPORT

TO

# THE BOARD OF MANAGERS

OF THE

# Schuylkill Navigation Company,

ON THE

# IMPROVEMENT

# OF THE SCHUYLKILL NAVIGATION.

BY

SOLOMON W. ROBERTS, CIVIL ENGINEER.

MEMBER OF THE AMERICAN PHILOSOPHICAL SOCIETY.

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JANUARY 2nd, 1845.

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PHILADELPHIA:
JOSEPH & WILLIAM KITE, PRINTERS,
NO. 50 North Fourth Street.
. . . . . . . .
1845.

# REPORT.

Philadelphia, January 2d, 1845.

To the Board of Managers of the Schuylkill Navigation Company.

Gentlemen:—

In compliance with your resolution adopted on the 23d of November last, I respectfully submit the following report on the Improvement of the Schuylkill Navigation.

The time for its preparation has been short, and the pressure of other duties, which could not be delayed, has prevented me from going into the subject in that minute detail which I would have preferred. But, as it is, I believe that the general results may be relied upon, and the facts in relation to the present condition of the navigation are correct, being derived from the surveys made last winter by Messrs. John Anderson and James F. Smith, acting under my direction.

The improvement of the navigation of the river Schuylkill, has been considered a subject of the first importance to the city of Philadelphia and the state of Pennsylvania, from a very early day. Even in colonial times, Dr. Franklin and other distinguished and patriotic men, turned their attention to the subject, but the magnitude of the work delayed the enterprise, although its importance was always acknowledged.

On the 8th of March, 1815, a perpetual charter was granted to the present Schuylkill Navigation Company, which, among other powers and privileges, allowed a period at first of fifteen, and afterwards of thirty years, to improve and perfect the works, which time has since been extended by a supplementary law until the 8th of March, 1860.

In the year 1816 the work was begun, and, considering the little practical knowledge then existing in the country, in regard to such undertakings, the general plan adopted was surprisingly judicious. It was soon found that the application of sluices on a part of the line would not be sufficient, and a complete slack-water and canal navigation was determined upon. Difficulties being experienced in obtaining the necessary funds, the late Stephen Girard, having examined the subject, made a heavy investment in the enterprise, which enabled the Managers to bring the whole work into use; and Mr. Girard continued until his decease to take a lively interest in the Company which he had so essentially aided; and the large amount of the stock and loans held by him, now forms a part of the munificent bequest of which the city corporation of Philadelphia is the trustee.

On the first of October, 1825, the line was first opened from tide-water at Philadelphia to Pottsville in Schuylkill county; and in 1828 it was extended to Mill Creek at the town of Port Carbon, a distance of two miles, thus forming a continuous canal and slack-water navigation, 108 miles in length, for ascending and descending boats, and uniting the two termini named in the charter.

The line then consisted of 63 miles of canals and 45 of pools, but a portion of canal, about six miles in length, near Reading, being leaky and troublesome, on account of the limestone formation over which it passed, was vacated in the year 1833 and river navigation substituted, which has been found to be a great improvement, and makes the present extent of slack-water 51 miles.

The locks were at first built, as required by law, 80 feet long in the chamber by 17 feet wide, but the channels were in many places crooked and narrow, and the depth of water was only three feet, so that the boats then employed in bringing that invaluable fuel anthracite coal from the inexhaustible coal mines of Schuylkill county, could carry a burthen of but twenty-five tons.

The rapid increase of the trade requiring further facilities, the doubling of the locks was begun in 1830, in order to pass the boats more rapidly, and by legislative permission, the additional locks were built 13½ feet wide, being the width required by the boats in use.

In 1834, the work of deepening the water to four feet was commenced, by raising the dams, locks and canal banks, and clearing out the channels; and the canals have been gradually widened as well as deepened.

## II.—OF THE PRESENT NAVIGATION.

The whole length of the line from Port Carbon, in the heart of the first great Anthracite coal field of Pennsylvania, to the suspension-bridge across the Schuylkill at Philadelphia, is $108\frac{21}{100}$ miles. The total lockage is 616 feet. The whole number of locks through which a boat passes is 109, of which 13 are guard-locks without lift, having their gates usually left open, and causing no delay to boats excepting when the river is high, 20 are guard-locks having some lift, and 76 are lift-locks. Fifty-one additional locks have been built to double the line, and in the case of a boat going through them, the whole number to be passed is reduced to 106.

The depth of water on the fifty-seven miles of canals is four feet, and on the fifty-one miles of pools it is usually from four to ten feet, the depth on nearly half the distance being five and a half feet or more.

The canals and locks having been at first arranged for a depth of three feet, which has since been increased to four, it is found that many of the locks will not allow of any greater depth of water unless the walls and plank linings are raised; and as a change to a navigation four and a half feet deep, with reference to a maximium boat load of 80 tons, would require such an alteration, it is better, to raise them at once so as to be adapted to a maximium depth of six feet or a minimum of five and a half.

The best boats now in use upon the Schuylkill Navigation are seventy feet long and thirteen feet two inches wide, and when drawing forty-six inches water they carry 66 tons of coal; and it is found that every additional *half inch* displaces one ton of water, or adds one ton to the boats capacity of carrying; so that such a boat when drawing five feet three inches will carry 100 tons; which has been verified by actual experiment with a boat which carried that cargo safely to New York.

For several years after the navigation was brought into use, each boat carried about 25 tons, and the time required for a trip from Pottsville to Philadelphia, and back, was about two weeks.

The expense of transportation has since been much diminished, a large part of the boats now carrying 60 tons, and the trip being often made within a week. At first it was proposed that the boats should be propelled by poling, but this idea was soon abandoned for the construction of towing paths, which have been substantially made throughout the line, and the boats are drawn by horses or mules, in some cases one animal and in other cases two being attached to a towing line.

With a boat carrying 60 tons and a steady trade, conveyed by horse power, seventy cents per ton is found to be a fair price for freight from Pottsville to Philadelphia, and it includes the expense of unloading the boat. For a considerable part of the past season coal has been carried on the Schuylkill at the extraordinarily low rate of one cent per ton per mile, including freight and toll and the cost of unloading.

The coal boats always run fully loaded, and carry as many tons as their size and draught of water will permit; and those which are furnished with decks pass, by the aid of tow boats, by the way of the Delaware and Raritan canal directly through to New York. This, which is a profitable trade, as at present carried on, may be greatly promoted by the further improvement of the Schuylkill Navigation.

## III.—Of the Proposed Improvements.

The demand for anthracite coal, the best fuel in the world, is constantly increasing. The quantity sent from the Schuylkill region in the year 1844, by the two means of conveyance now existing, has been 840,617 tons, being 164,544 more than in 1843, and it will no doubt soon exceed a million of tons per annum. In the last year the Schuylkill Navigation has carried 174,584 tons of miscellaneous freight, so that the aggregate tonnage of the Schuylkill valley has been more than a million. This is a tonnage so immense that it is difficult for the mind to form an adequate idea of it, and the subject of cheapening its transportation as much as possible becomes of proportionate importance.

Only a small part of this vast supply of fuel is consumed at Philadelphia, the great bulk of it being sent to New York, and to other centres of population and industry farther to the north and east, whose inhabitants are deeply interested in obtaining these essential supplies by the cheapest means of conveyance. Water communications exist with them all adapted to vessels of a larger size than the boats that now traverse the Schuylkill Navigation, and although the boats now in use carry coal without transhipment from Pottsville to New York, an increase of their dimensions and capacity is exceedingly desirable.

Several of the principal dams on the lower part of the navigation have been rebuilt within a few years with reference to an increased depth of water, and a system of coffer damming to deepen rock shoals, and of dredging gravel bars, has been steadily pursued, so as to obtain a depth of five and a half feet at low water or of six feet at ordinary times. Of the fifty-one miles of the line in the river, about one half now have the desired depth or one still greater; but whilst the deepening is carried on locally it does not help the trade, which is a strong reason for pushing it immediately throughout the whole line, so as to reap the advantages of the work already done.

This matter is not to be looked at as a thing of temporary importance, but as affording the best avenue for the supply of coal, both now and for generations to come. The cheapest channel from the coal region to the great points of consumption must command the trade, and transhipment being both expensive and detrimental, is to be avoided as much as possible.

The Schuylkill Navigation is an integral work, all owned by one company, with a perpetual charter. Instead of attacking the extremities, it penetrates the heart of the coal region, and receives its supplies in all directions, from a multitude of collieries, covering a wide extent of country, which renders its trade conveniently capable of vast expansion.

The results of the surveys made in the past year show that the works are susceptible of a corresponding enlargement at a moderate expense; and it is the part of true wisdom now to adopt an adequate, judicious, and comprehensive plan, according to which all new work shall hereafter be done, and which shall be vigorously urged to an early and final completion.

In respect to the deepening of the water, such a plan has been long contemplated, and has been gradually progressing. It is known that with a draught of 5 feet 3 inches, boats of the present size will carry 100 tons of coal. During the progress of the surveys, the pools were carefully sounded, and the canals, locks, and other works examined, with reference to the proposed improvement, and the general result is, that the estimated cost of obtaining a depth of at least 5 1-2 feet throughout the line, and adapting the present works to the change, is $366,000; to which I propose to add one-third for contingencies and probable damages, being the sum of $122,000, and making an aggregate of $488,000.

With the accomplishment of this object, it might be proposed to stop; but, looking upon the Schuylkill as a part of that great line of coast and inland navigation, which connects us with the East and North, and generally with the seaboard cities and towns, I am satisfied that true policy requires us to take another and a bolder step in advance.

The locks of the first set were built 80 feet long in the chamber, by 17 feet wide; they have since been doubled to a great extent, by others 80 feet by 13 1-2, and a few have been built of a larger size. Seventy feet by 13 feet 2 inches is the maximum size of boats which can now pass throughout the line; and the locks ought to be longer, as it is believed that for economy in transportation, a boat may be advantageously built with a length of seven times its breadth.

Many considerations influence the question of the size best to be adopted for a new tier of locks upon the Schuylkill Navigation; and after deliberating long and earnestly upon it, I have come to the conclusion that they ought to be 110 feet long in the chamber, by 18 feet wide, which is the size of the locks of the enlarged Erie Canal of New York, and the same length, as the locks of the Delaware and Raritan Canal of New Jersey.

Such a lock, with the proposed depth of water, will pass a boat containing from 150 to 200 *tons of coal;* or in other words, of three times the tonnage of the boats now in use; and the walls should be built high enough to admit of an increased depth if required.

The next question is the proper plan of building the locks, and the probable cost.

A very large number of locks have been built in our country on a great variety of plans, and the Schuylkill Navigation furnishes specimens of different kinds. Many canals show the fact that cut stone locks, unless built of hard stone, and in a very expensive way, are but little more durable that timber structures, whilst their repairs are much more costly. The water penetrates the walls, and the powerful action of the frost in our climate soon injures them seriously. These evils may be prevented in cut stone locks, but only by the construction of masonry of a very expensive character.

When locks are built of substantial dry walls, depending on a plank lining to make them tight, the little water that leaks through the planking flows freely through the walls without injuring them. As the stone do not require to be dressed, hard and durable materials may be used; and if such walls are properly proportioned and well built, they may be considered as imperishable. Such locks have been constructed in this state, with lifts of more than twenty feet, and they answer their purpose well.

There are many lined locks on the Schuylkill; and when the planking decays, it is readily renewed, after lasting about ten years. The principal difficulty experienced with them is from the inconvenience of renewing the string pieces built in the wall, and to which the planking is spiked, when that becomes necessary. It is found, however, that this can be successfully obviated by spiking the planking to posts secured against the walls, but not built into them; and the whole can be so arranged, that when in process of time the woodwork requires renewal, it can be entirely stripped off, and replaced, without disturbing the walls. This can be done in the winter, when the navigation is suspended; and it is probable that by the time a second casing would be needed, the materials for it could be prepared by some preservative process which would make them last a long series of years.

The Schuylkill Navigation Company has the means of manufacturing excellent cement at a cheap rate, which is used to great advantage on the line, and with the undressed stone from some of the quarries, substantial water-tight cemented walls can be built, which require no lining. It is found that there is no material difference between the cost of the cement mortar and that of the plank lining; so that a choice may be made between the two plans according to circumstances.

It is not proposed to make any material change in the levels of the navigation as now constructed; but in some instances they should be altered for a short distance, in order to diminish the number of locks. In arranging the lifts where changes are made, I propose to adopt a maximum of about fifteen feet, which is only half as high as the lift of a lined lock in actual use in this State.

Where combined locks at present exist, their number will be much diminished, and in no case will there be more than two together.

Detailed tabular statements of the present and proposed arrangement have been prepared, and the general results may be briefly stated in a short table, as follows, omitting fractions for the sake of simplicity.

TABLE OF LOCKAGES, &c.

| | Miles. | Feet lift. | Present arrangement. | | | | Proposed arrangement. | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | Guard Locks | G. & Lift Locks | Lift Locks | Total Locks | Guard Locks | G. & Lift Locks | Lift Locks | Total Locks |
| Philadelphia to Reading . . | 65 | 195 | 5 | 6 | 21 | 32 | 4 | 7 | 15 | 26 |
| Reading to Port Clinton . . | 25 | 197 | 2 | 6 | 28 | 36 | 4 | 4 | 14 | 22 |
| Port Clinton to Port Carbon | 18 | 224 | 6 | 8 | 27 | 41 | 9 | 5 | 20 | 34 |
| Totals. | 108 | 616 | 13 | 20 | 76 | 109 | 17 | 16 | 49 | 82 |

Excluding guard locks without lift, the proposed change raises the average lift of the locks from about 6 1-2 to 9 1-2 feet each, and the reduction in their number is highly important. It will be observed that between Philadelphia and the important town of Reading, one of the largest in the state, and where the Union Canal from the Susquehanna enters the line, the distance is 65 miles and the lockage averages only three feet per mile. When the Union Canal is properly enlarged, its junction with your works will be of greatly increased importance to the Schuylkill Navigation.

Between Philadelphia and Port Clinton at the mouth of the Little Schuylkill, where the coal from the Tamaqua region is shipped, the distance is 90 miles and the lockage 392 feet. By the proposed arrangement, the number of *lift locks* on this distance will be reduced from 49 to 29. And on the whole line of 108 miles with 616 feet of lockage, the number of locks of all descriptions will be reduced, as shown in the table, from 109 to 82, making a reduction of 27, whilst the guard locks without lift, and of which the gates usually stand open, so as to cause no detention to boats, are increased from 13 to 17.

Where the locks are now doubled, I propose to remove one of them and erect the new lock in its place; and I estimate the value of the old materials to be equal to the cost of removal and of preparing the site. In the meanwhile the navigation can be carried on through the other lock.

There are numerous and excellent quarries on the Schuylkill, some of which are owned by the Navigation Company, and water carriage to all the points required, will afford great facilities for the transportation of materials.

By a calculation made by myself, in conjunction with two of the canal superintendents, it appears that the probable cost of the materials and workmanship of such a tier of new locks as is here recommended, estimated at the prices which have been heretofore paid for similar work, would be about $400,000. To which I propose to add for the excavation of some of the pits where the locks are not doubled, and for coffer damming, pumping, and other contingencies, 25 per cent. or $100,000. In addition to which I add for new approaches, pier heads, lie-bys for boats, and some protection walls, &c. the sum of $92,000, making an aggregate of $592,000.

For this sum I believe that the work can be actually accomplished in a substantial and workmanlike manner, and I have no doubt that most engineers would estimate it materially lower.

The estimate may be thus summed up.

| | | |
|---|---|---|
| Cost of increasing the depth of water | | $366,000 |
| Add for contingencies and probable damages | | 122,000 |
| Making the cost of obtaining an 100 Ton navigation, with locks of the present size | | $488,000 |
| New Tier of Locks 110 by 18 feet of diminished number. | | |
| Estimated cost of materials and workmanship | $400,000 | |
| Sundry lock-pits, pumping, and contingencies | 100,000 | |
| Add for additional work | 92,000 | |
| Making the estimated cost of the new Tier of locks with their appendages | | 592,000 |
| Estimated cost of the proposed work. General aggregate | | $1,080,000 |

Which is equal to an average of $10,000 per mile for 108 miles, the length of the line. This appears to be a large sum until it is compared with the importance of the object, but it should be remembered that it is about the same as the usual cost of a single track of railway superstructure, of the best kind constructed in our country, and which is soon worn out under a heavy trade.

The next question is, will the work when done repay its cost?

Of this I think there can be no doubt. The supply of water at all ordinary times will be ample, and when necessary the reservoirs on Tumbling run can be resorted to, which contain 65 millions of cubic feet of water. Besides which the Company owns a tract of land intended for a future reservoir on Stone creek near Port Clinton. It must be recollected also, that when boats of three times the present tonnage are used, the number of lockages for the same amount of trade will be reduced two-thirds.

It has been found heretofore that the decrease in the cost of freighting has been nearly proportional to the increase of the number of tons carried in a boat. Coal in large quantities has been carried upon the Schuylkill Navigation in 60 ton boats at the rate of 65 cents per ton per 100 miles, including unloading. With boats of treble the present capacity propelled by steam and running two or more in a train, it is believed that the cost of freighting could be reduced to from 25 to 30 cents per ton, and so as to combine with this great reduction the vast advantage of being able to proceed directly on to the ports where the bulk of the coal is wanted.

The recent success of canal steam navigation on the Chesapeake and Delaware and the Delaware and Raritan canals, and especially upon the Champlain canal in our country, and also upon the Birmingham and Liverpool junction canal in England, proves that that important problem is successfully solved. The multiplication of steam propellers has astonished the public, and many men of great ingenuity are devoting attention to their improvement. Horse power may be considered to have reached its perfection, while steam is constantly progressive. In a boat on still water a steam engine works to great advantage, and in burning small coal it consumes the cheapest kind of fuel, which in the coal region may be obtained at a minimum cost.

The speed in the river portions of the navigation may be increased greatly beyond the convenience of horses, and when tide water is reached, and horse power becomes unavailing, without ceasing to be costly, steam not only does away with the necessity of transhipment which is both expensive and detrimental to the freight, but carries it without delay to its place of destination.

The present mode of carrying coal from Pottsville to New York, without transhipment, is as follows. The boats having been drawn by horses from Pottsville to Philadelphia, are then towed by a steam tug, carrying the horses on board, to

Bordentown; the horses then draw them through the large canal from the Delaware to the Raritan, and remain at New Brunswick until the boats make their voyage to New York and back, by the aid of another steam tug. Notwithstanding the delays incident to such a system of transportation, and the time lost by the horses, 111,521 tons of coal have been carried through in this way in the past season, and a large amount of freight brought in the returning boats. This is the system which has been in use for a number of years.

Even if horse power should still continue to be employed as at present, I believe that the money expended in the judicious improvement of the Schuylkill Navigation would be well invested; and the recent success of canal steam navigation, furnishes an additional argument for the early execution of the work, on account of the increased economy of using steam in boats of larger dimensions.

There is a peculiar propriety in enlarging the locks, to the size of those of the enlarged Erie Canal, of New York, which are 110 by 18 feet, the length being the same as those of the Delaware and Raritan Canal, of New Jersey; so that the Schuylkill coal boats, propelled by steam, may carry maximum cargoes at minimum cost, and go directly from the mines to the port where the coal is needed, be it far or near; and so that the great fleet of boats which shall hereafter navigate the enlarged Erie Canal of New York, may all be able to traverse the Schuylkill Navigation. Considering the question of cheap fuel, and viewing the subject in a comprehensive light in reference to a great system of inland and coast navigation, it assumes indeed the importance of a national object.

And the capacity for such an enlargement, at a moderate expense, is an important element in the present value of the existing navigation; for sooner or later I am confident that the work will be accomplished, and the sooner the better for the interests of the Company.

The present works have cost nearly four millions of dollars, and their capacity may be trebled for about one-fourth of their original cost.

The navigation was made to provide for a trade that it was hoped might be created, it is now proposed to improve it to accommodate a vastly greater trade that already exists, and is rapidly increasing, and in my opinion the whole work may be readily accomplished in two seasons, without greatly interfering with the trade upon the line; and, after the new locks are built, the boats now in use may be advantageously lengthened.

It is understood that the water in the Delaware and Hudson Canal has been recently deepened, at a small expense.

The Schuylkill Navigation Company has received in 1844, more than $20,000 in rents, principally for water-power, and it is believed that the sum will be greatly increased in future years with the progress of manufactures. More than four hundred thousand dollars of the Company's profits having been disbursed in reduction of indebtedness, the capital stock at par is now nearly equal to the amount of the loans, and the aggregate of the stock and permanent loans is less than three and a half millions. If from this we deduct the present value of the rents and real estate of the Company, it will bring the amount below three millions for the navigation itself, as at present constructed. This is a very small sum, when the value of the work is considered, and in reference to the question of a division of profits, it is a highly important view of the case.

In looking forward from the past and present, to the future, after the navigation is properly improved, it is difficult to appreciate the innumerable advantages that will flow from the execution of the work, not only to the proprietors, but to the public at large. In addition to the trade with the east and north, the line will be thrown open to steamboats, from the maritime towns of Delaware, Maryland and Virginia, and from the canals, rivers, and bays of the southern coast, which will add to the coal trade of the Schuylkill, and be highly advantageous to the cotton manufactories on its banks, which already give employment to a large population.

The city of Philadelphia is deeply interested, being as a corporation, the largest stock and loan holder in the company, and on account of the great increase in its commerce, and the promotion of those manufactures which are so important to its growth and prosperity, which is especially true of the western part of the city. And anthracite coal is the principal article which Philadelphia sends to the eastern states in exchange for manufactures, for the production of which, cheap fuel is one of the most essential requisites.

The captain of one of the finest steamboats on the St. Lawrence, when stemming the current of that mighty river, between Quebec and Montreal, in August last, informed me, that he was then burning Pennsylvania Anthracite coal, brought by sea from New York, and that he found it much better than the Welch Anthracite, which was used in combination with it. The small steamboats forming the line through the Champlain Canal, between New York and St. Johns, in Canada, use the same fuel, and one of them has performed 10,165 miles in a single season at a small expense, and having a barge in tow a considerable portion of the time. The rapidity with which coal has taken the place of wood for steam navigation, is one great cause of its increased consumption.

The complete success of the application of Anthracite to the manufacture of iron, has given a new impetus to the iron trade in the valley of the Schuylkill, where it is carried on to great advantage, and where it will, I believe, increase to an extent that cannot now be computed. Coal, ore, and limestone, which are necessary in making iron, abound upon the Schuylkill, with water carriage for their transportation, and with vast water-power. That these advantages are beginning to be appreciated, is shown by the fact that the iron trade upon the Schuylkill Navigation has increased more than sixty per cent. in the last year.

Cheap coal and cheap iron have made England the workshop of the world, and these materials exist together in Schuylkill county, as they do in Great Britain. As an evidence of their value in that country, I may state, that when passing the latter part of 1836, and the earlier part of 1837, among the iron works in the mineral basin of South Wales, I became acquainted with the following facts: The part of that coal basin in which those works are situated, contains one hundred square miles; and in it were at work one hundred and eight blast-furnaces, which produced in the year 1836, no less than 354,919 tons of pig-iron, a large part of which was immediately made into bars; requiring a gross consumption of about a million and a half of tons of bituminous coal. In addition to this, the quantity of coal consumed for other purposes, and shipped from the several ports of South Wales, amounted, in 1834, according to the best authorities, to two millions of tons; making the number of tons annually mined in that coal basin, three and a half millions. This immense branch of industry has not been the growth of ages, but of the present generation; and the Welch coal trade may be considered as in its infancy, when compared to that of the north of England.

The inhabitants on and near the Schuylkill, with those of Pottsville and the other towns in the coal region, together with persons residing or possessing property between the Schuylkill and the Susquehanna ; and large numbers who have interests in the neighbourhood of the last named river, are all interested in the proposed improvement of the Schuylkill Navigation.

It is out of my power to enumerate all the collateral benefits that will flow from the execution of the enterprise.

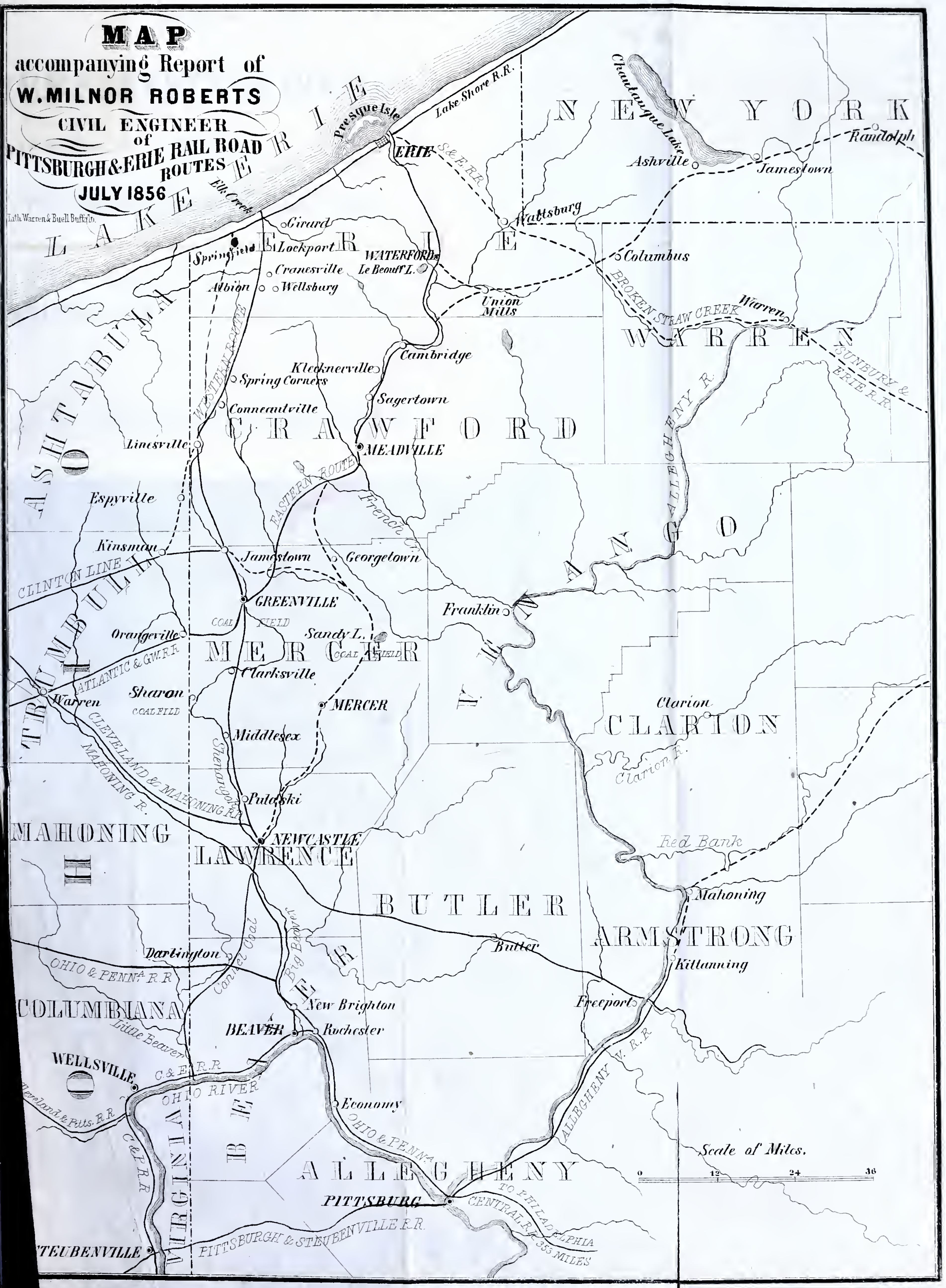
To the stockholders it will add vastly to the value of their stock, and in advancing their own interests they will promote the public good.

I have given a brief historical sketch of the Schuylkill Navigation Company, and a description of the present works and their tributary trade. I have recommended what is, in my opinion, an adequate, judicious, and comprehensive plan for their further improvement, founded on the information derived from the recent surveys ; and in estimating the cost and consequences of the work, it has been my aim to speak with truth and earnestness, believing that after it is completed it will develope results such as I have endeavoured to describe.

All which is respectfully submitted.

Solomon W. Roberts,
Civil Engineer.

Philada. Jan. 2nd, 1845.



# MAP
accompanying Report of
**W. MILNOR ROBERTS**
CIVIL ENGINEER
of
PITTSBURGH & ERIE RAIL ROAD
ROUTES
JULY 1856

Lith. Warren & Buell Buffalo.